Noteworthy anatomical and physiological researches.

The embryo-sac of Taraxacum.

Now that morphological attention among angiosperms, especially the dicotyledons, is being focussed upon the embryo-sac, it is important to note any careful observations that have been made. In *Flora* **82:** 32 *et seq.* 1896, Siegfried Schwere has published an elaborate paper upon *Taraxacum officinale*. Its scope includes the topics: (1) the present condition of the embryological question; (2) the embryo-sac, fertilization and formation of the embryo; (3) formation and resorption of the endosperm; (4) the integuments and later seed coats; (5) the pericarp; (6) biological considerations. Only the main points of the second topic are here considered. The author discovers that Taraxacum often has two ovules in the ovary, which may differ in size, but otherwise show normal development. No fruit was found containing two mature seeds, but two embryo-sacs were seen, each containing an embryo developed sufficiently to show the cotyledons. The egg-cell, which is rather deep in the sac, is easily recognized by its size and contour, and its nucleus is nearly as large as the endosperm nucleus. The synergidæ are at the extreme end of the sac and do not extend into it nearly so far as the egg-cell, and their nuclei are smaller than those of the egg-cell and the endosperm-cell. The synergidæ persist for an unusually long time, retaining a plump appearance after walls have begun to form in the endosperm. The antipodals vary in size, shape and arrangement, but their number, three, is constant. The author seems to doubt Hegelmaier's statement that in Taraxacum he had observed four or five antipodals in a longitudinal row, but recent studies in Compositæ suggest that such a condition is not at all unlikely. The antipodals are said to persist as long as the synergidæ. The author claims to have discovered in Taraxacum the first case of synergid fertilization noted in dicotyledons. Whether such a sac would develop two embryos or not is a question yet to be determined.

The first division of the fertilized egg-cell separates an embryo-cell from a suspensor-cell, and the latter retains its charac-

ter during the first divisions of the embryo, after which it begins to divide in basipetal order. When the embryo begins to show cotyledons, the suspensor, with the exception of the so-called "hypophysis," contains a row of from two to four cells. When the growing cotyledons have given the embryo the characteristic cordate form, the number of suspensor-cells is also found to have been increased. The "Anschlusszelle," or suspensor cell next the embryo, plays a special rôle. The other suspensor cells divide in somewhat irregular fashion, but in this one the first wall is vertical, and vertical divisions follow in planes at right angles to each other. This does not agree with Fleischer's account of Helianthus, in which the Anschlusszelle has two transverse walls before vertical divisions begin. A little later, vertical divisions occur in the cell below the Anschlusszelle. The descendants of these two cells take part in the formation of the embryo, which by this addition has become nearly spherical.—CHAS. CHAMBERLAIN.

Correlation effects following mechanical hindrance of growth.

In a recent contribution on growth-correlations, Dr. Franz Hering[1] reports some very interesting results. He takes issue with the conclusion reached by Kny[2] that the growth of root and shoot of seedlings proceeds with a high degree of independence, and points out that in his study Kny took cognizance only of the end-results of growth through long periods and neglected to look for temporary modifications that were soon concealed by further growth. Hering finds that interdependence between these systems is pronounced. He cites experiments by Stone showing that when the epicotyl was removed from a seedling, the growth rate of the root immediately decreased; after a time, however, it regained and, indeed, surpassed its normal rate, as a result of the increased activity connected with the process of repair. In consequence, the total growth during an extended period would equal or exceed that of the control objects.

By use of Pfeffer's method of confining parts in plaster of Paris casts, the author investigated the action resulting from mechanical hindrance of the growth of a system, or of a part

[1] Ueber Wachsthumscorrelationen in Folge mechanischer Hemmung des Wachsens. Pringsh. Jahrb. f. wiss. Botanik **29:** 132–170. 1896.

[2] Annals of Botany **8:** 265. 1894.